Drinking Water Monitoring Data for Tracking and Linking Studies

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Purpose

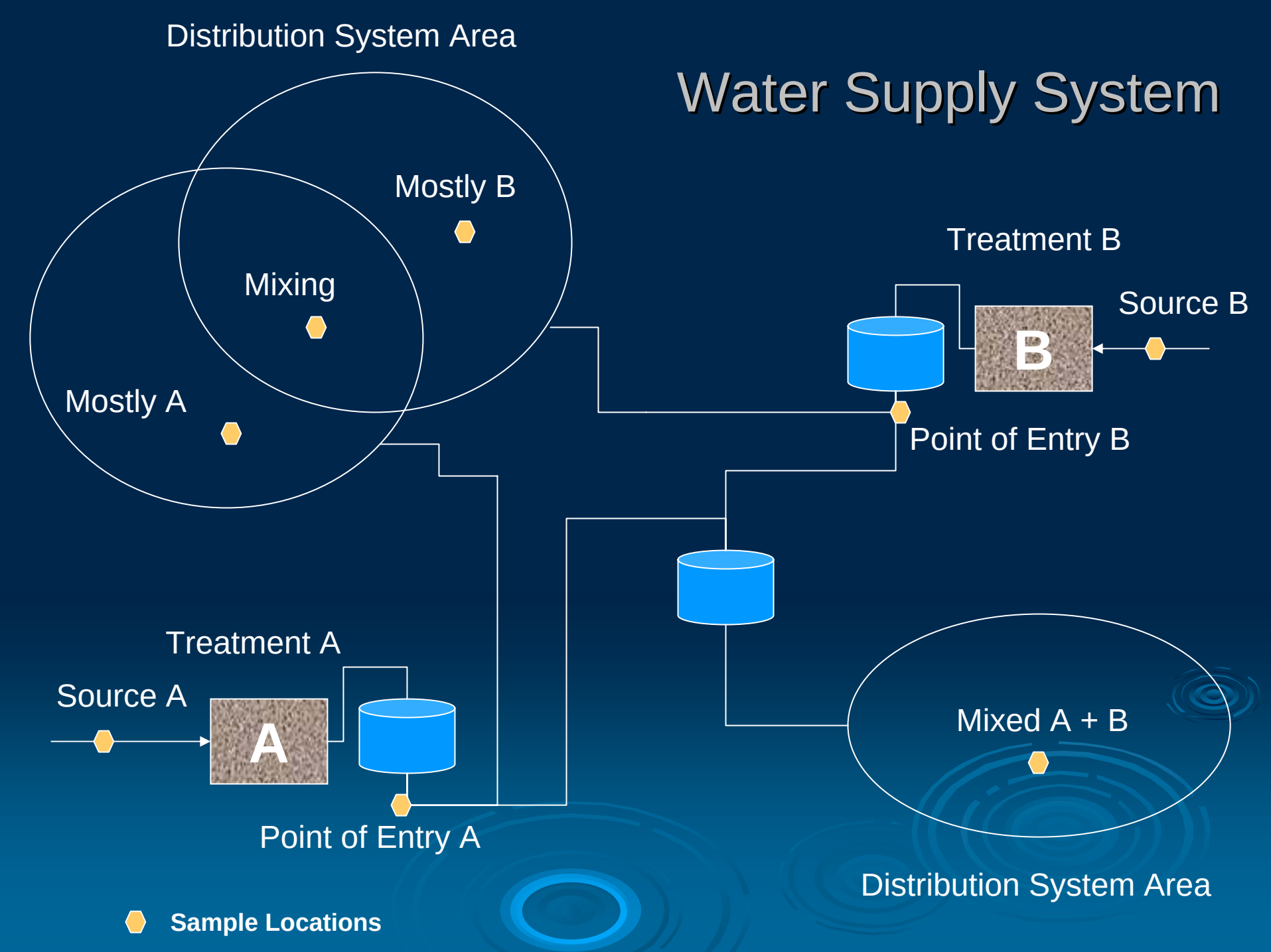
- Describe development of a historic water quality database and GIS map
- Show example applications to tracking and linking studies

Drinking Water Exposure Assessment

- Exposure (at ***x,y,t***) determined by:
  - Water quality
  - Personal behaviors
    - Ingestion, inhalation, dermal contact

Water Quality Estimates at ***x,y,t***

- Measurement
- Flow and/or water quality model
- Source water (surface, ground) and/or treatment type (disinfected, fluoridated)


Distribution System Area
Water Supply System
Mostly B
Mixing
Mostly A
Treatment B
Source B
B
Point of Entry B
Treatment A
Source A
A
Point of Entry A
Mixed A + B
Distribution System Area
Sample Locations

Issues With Historic Drinking Water Data

- Water system operational context
- Measurement data availability
  - Result, ***x,y,t***
  - Contaminant scope
  - Geographic and temporal resolution
- Measurement data quality and consistency
  - Misreporting, miscoding, data entry errors
  - Changes in laboratories, methods, detection limits, reporting limits

Development of Historic (1978-1990) Water Quality Database and Maps

- Compile water quality data
  - Extract data from multiple sources
  - Make sense of it
- Map water supply system areas
  - Digitize (from paper maps)
  - Divide into subsystems as needed based on water quality data and system information
- Estimate average contaminant levels for each subsystem for 6-month periods

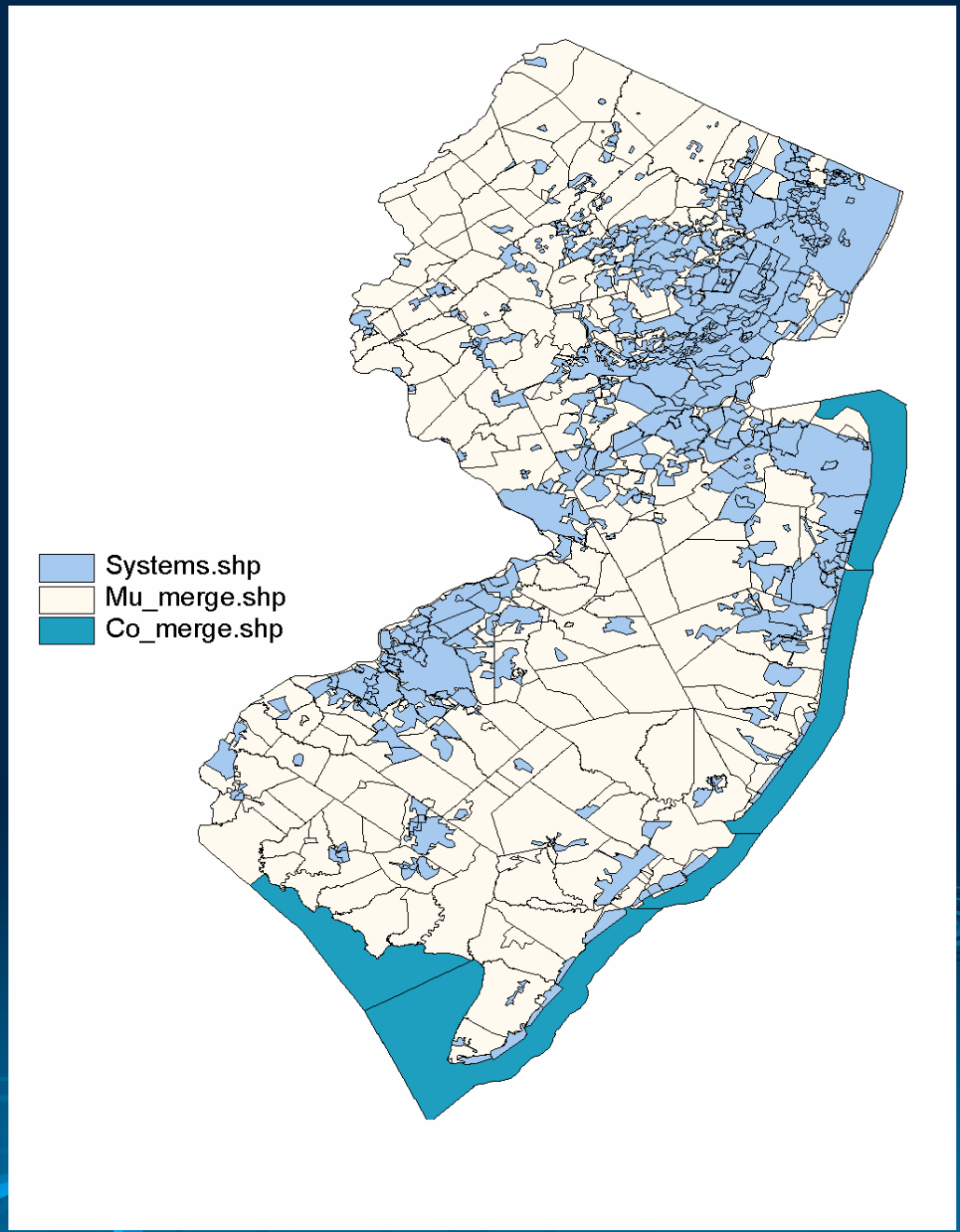
Hierarchy of Estimate Bases

- Distribution area
- Point of entry (treated)
- Source water (untreated)

- Time extrapolation or interpolation
- Geographic interpolation

- Source water type

Map of Public Water Supplies in New Jersey, 1990



Characteristics of Mapped Water Systems

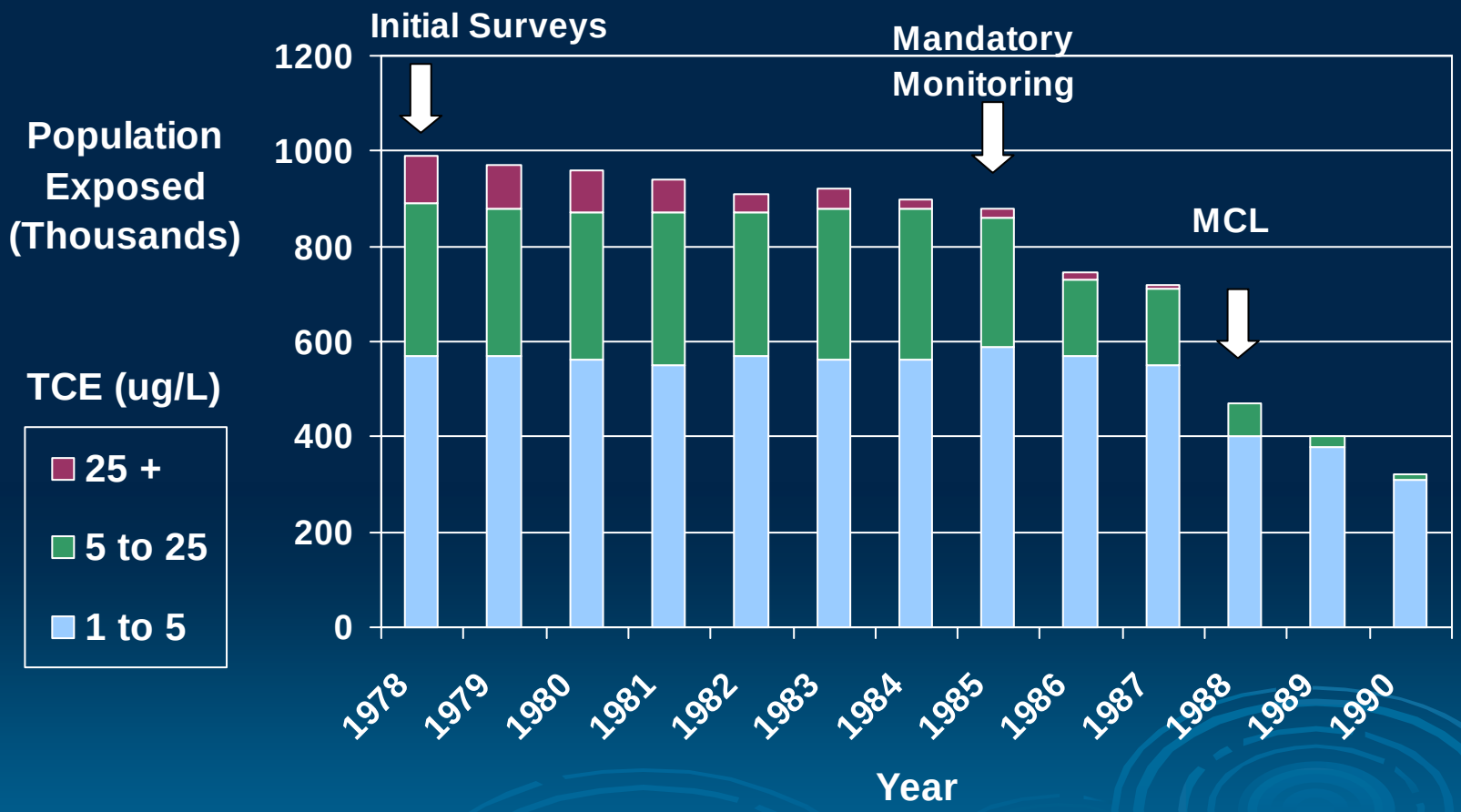
Source	Points of Entry	Number of Systems	Number Divided into Subsystems
Surface Water Only	Single	16	1
	Multiple	5	2
Ground Water Only	Single	60	2
	Multiple	173	32
Mixed Surface and Ground Water	Single	4	0
	Multiple	37	24
Total		295	61

Tracking Example: Population Exposed to TCE

- Indicator: Number of people served by public water exceeding MCL for TCE

- Assign populations to water system polygon areas
- Sum populations in water system polygons within ranges of TCE levels

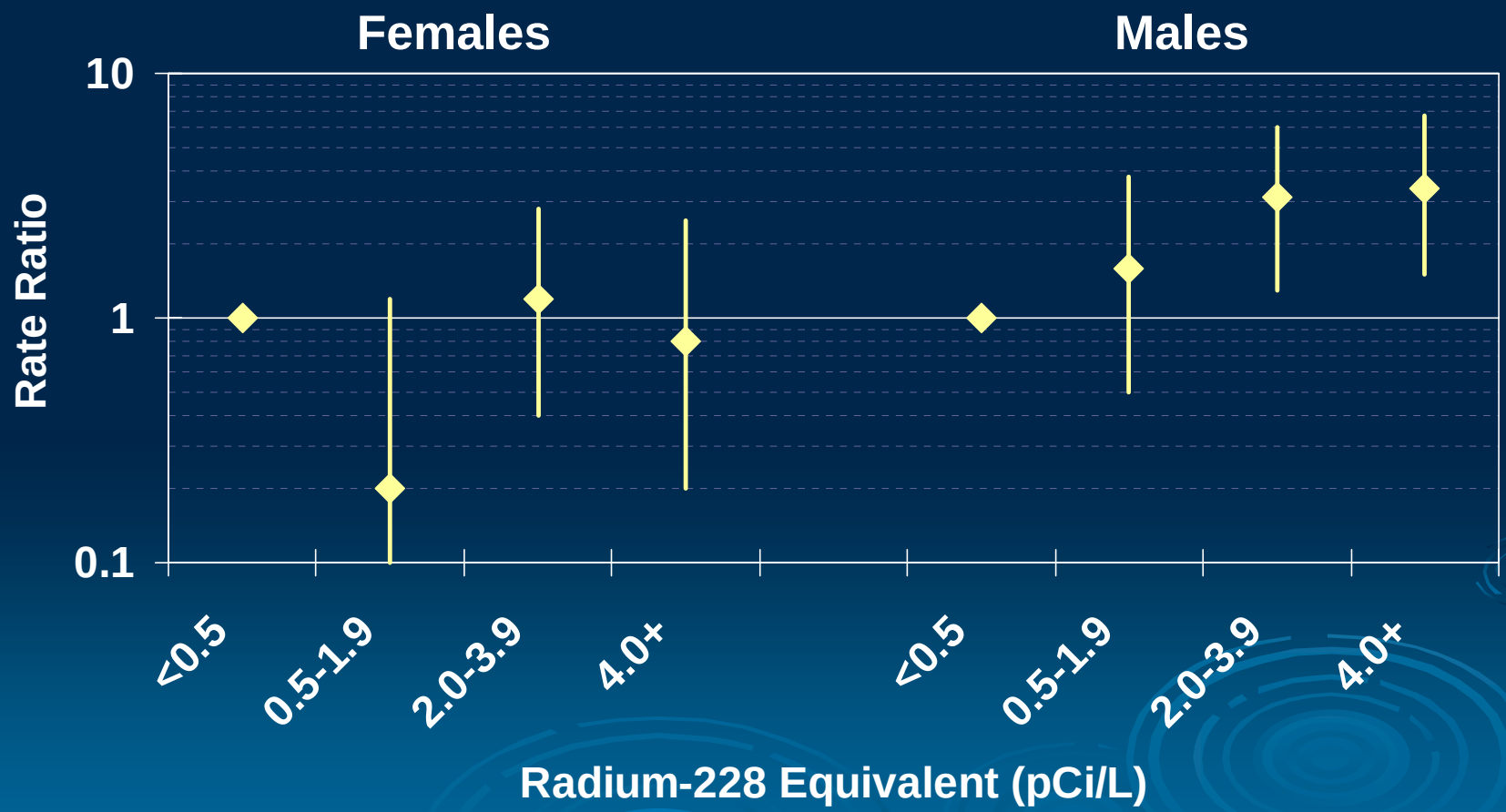
N.J. Population Exposed to TCE in Public Drinking Water, 1978-1990



Linking Example: Radium and Osteosarcoma

- Characterize radium levels
- Compute populations exposed
- Assign cases (1979-1998) to water systems
- Compare osteosarcoma incidence rates among populations with different levels of radium in drinking water

Osteosarcoma Rate Ratios By Ra-228 Equivalent Levels



Parkway Well Water Distribution (August 1995)